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SMART BELT FOR BLIND PEOPLE

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ABSTRACT

Finding reliable path is a real challenge for a blind people. Majority of blind people use a conventional white cane to aid in navigation. The limitation in white cane is that the information is gained by touching the objects by the tip of the cane. Even if there are braille signs, a blind may not be able to identify them. Most of the electronic canes currently available at the market mainly target to identify only the predetermined locations and paths. Anyway, always wearing a traditional white cane or an electronic cane makes people uncomfortable. This research makes blind people comfortable and path is made reliable to travel by identifying the objects around him using ultrasonic waves. Also it sends short message service (SMS) with current location details of the user to a preprogrammed mobile user by utilizing global system for mobile communication (GSM) and global positioning system (GPS) technology if the blind losses the way or an emergency situation is occurred during outdoor travelling. A prototype has been built on Atmega 328P using Ultrasonic, GPS and GSM technologies.

Keywords: Ultrasonic sensors, GSM module, GPS module

1. INTRODUCTION

Our society consists of various kinds of disable people. Some of these have been disabled from their birth and some due to various accidents. In Sri Lanka for last few decades people faced a civil war and many soldiers and civilians lost their lives and some became disable. Truly these people need more attention and assistance from the society to do their day today activities. The goal of this research is to pay more attention on visually disabled people. Approximately 39 million people in the world are blind in 2014 according to World Health

Organization. Already there exit few ways to find correct path to blind people. Majority of them are using a conventional white cane to aid in navigation. If the person is using only a white cane and they are totally blind, they had better have very good mobility and orientation skills. It is possible to do but it usually takes years of practice and most blind people haven't been blind all their lives. So, many blind people really struggle with this. But let's assume a highly skilled blind person who has been blind for at least ten years. Again, if the person is going somewhere where they have been before they will keep a very detailed memory, involving counting driveways, streets, corners and even paving tiles, hearing and counting buildings, feeling common air currents, remembering landmarks such as the smell of a particular tree, the small bump at the corner of that sidewalk and the sound of traffic on that large street. Also they become helpless if they lose the cane their way while outdoor travelling [1].

Another method is electronic canes. Most of the electronic canes currently at the market mainly aimed to identify predetermined locations and paths only. Use a guide dog is another method of finding way. If blind people have a guide dog the dog will likely know most of the places they regularly go and will lead them there without any real trouble. But it is a very expensive method [2].

2. EXPERIENTAL

The block diagram of proposed system is shown in figure 1.

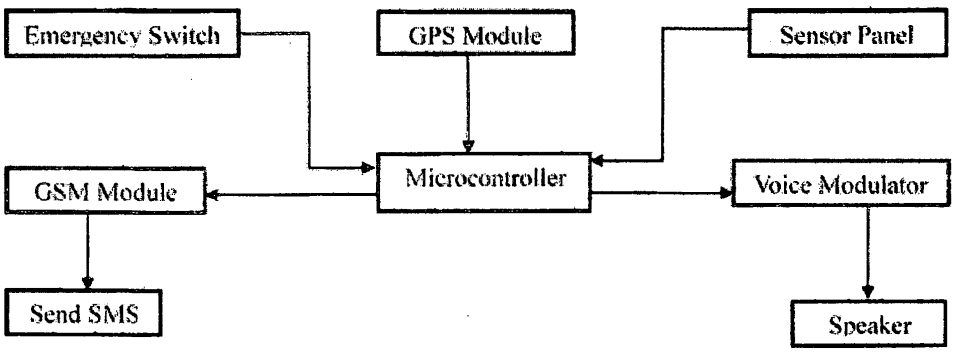

Figure 1: Block diagram of Smart belt for blind people

The Smart belt for blind people has three major units .Those are Sensor panel and Microcontroller, Voice Recording/Playback and Emergency unit.

2.1 Sensor Panel and micro controller

The system consists of three HC-Sr04 ultrasonic sensors for checking Front, Up and Down areas as following figure 02.

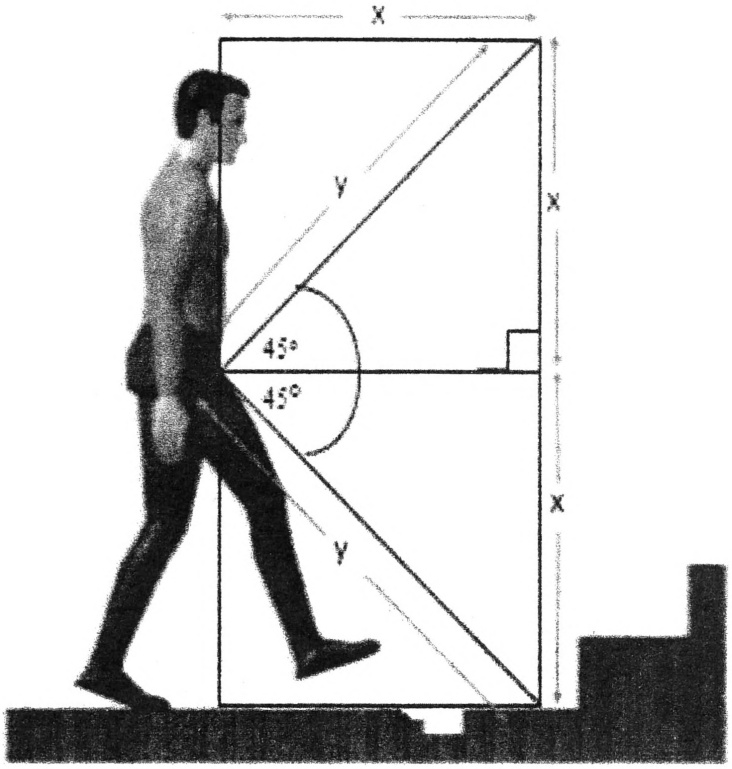

Figure 2: Covering Aria

The device was programmed assuming the blind person's height is around 1.8m (180 cm) then X distance is around 0.9m (90cm) and y distance is around 1.27m (127 cm).

The HC-Sr04 ultrasonic sensor it provides 2cm to 400cm non constant measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. Using input trigger for at least 10us high level signal, The Module automatically sends eight 40 kHz and detect whether there is a Pulse signal back. If the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.

Distance = high level time × velocity of sound (340m/s) / 2 [1]

The sensor consists with four wire connection nodes and two pins for data communication as Output and Input respectively Echo and Trigger. Others for input 5v operation voltage. Entire

calculations, commands arithmetic and logic operations are done by using Atmega 328P microcontroller [3].

2.2 Voice Recording/Playback unit

The APR9600 device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds. The device supports both random and sequential access of multiple messages. Sample rates are user-selectable, allowing designers to customize their design for unique quality and storage time needs. Integrated output amplifier, microphone amplifier, and AGC circuits greatly amplify system design. The device is ideal for use in portable voice recorders, toys, and many other consumer and industrial applications. Atmega 328 microcontroller communicates with the voice chip to provide relevant voice output. A microphone is used to record sounds into the APR9600 device and a speaker is used to playback the sound.

2.3 Emergency unit

Emergency unit consists of GPS module, GSM module and an emergency switch. An emergency situation is occurred, blind person can activate the emergency unit by pressing the emergency switch. Coordinates of the current location is read by GPS module. GSM module use to send SMS to preprogrammed mobile user. All the operations of GSM and GPS modules are done by microcontroller [4].

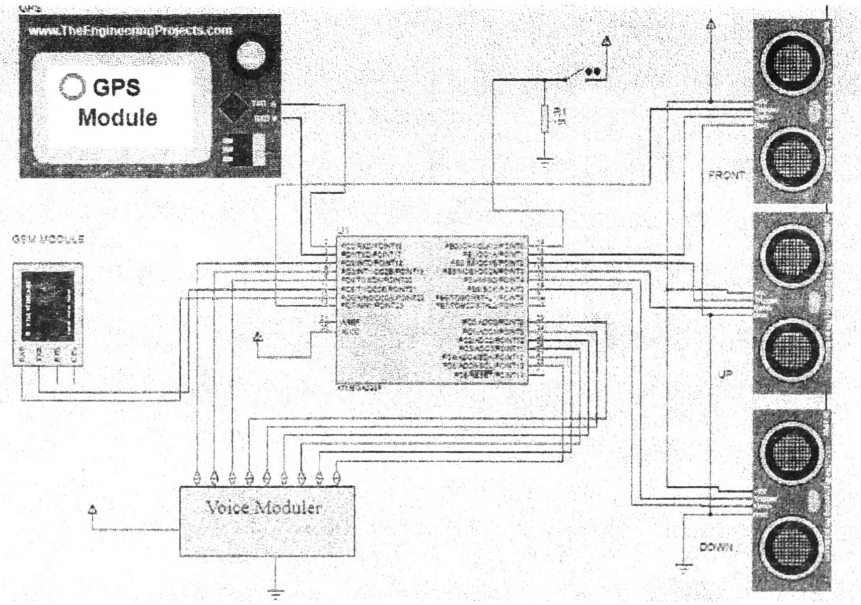

Figure 3: Circuit Diagram

3. RESULTS AND DISCUSSION

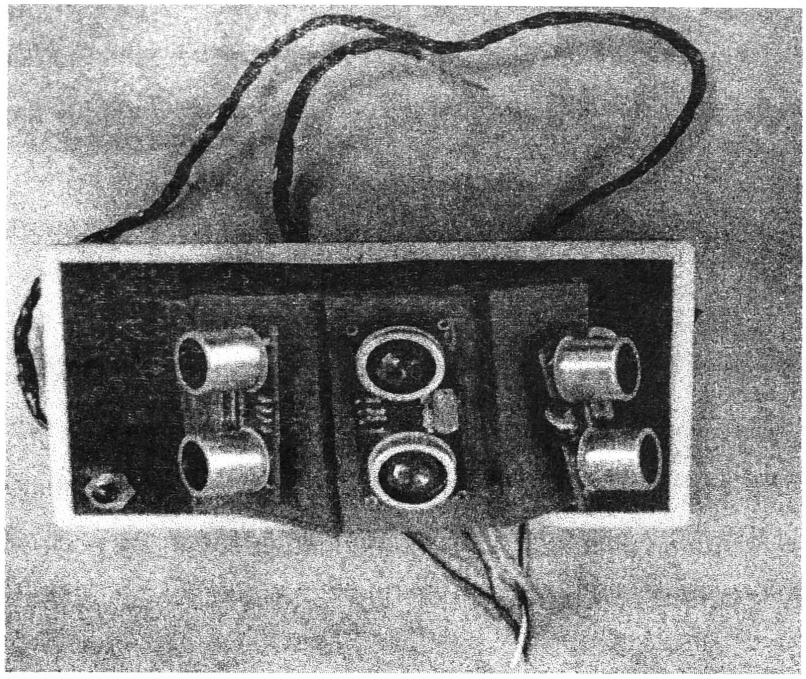

Figure 4: Prototype of the system

The smart belt for blind people is designed and developed for the blind person to identify path appropriately. Final outcome of this project is successful identification of the path by this system.

The device is built for both indoor and outdoor navigation but also be developed it as a location identifier. It include special emergency key, it helps the protection of the user while outdoor travelling. Cost of the used requirement is depending on the accuracy of the system. The cost of producing this device is shown in following table.

Table 1: Cost of producing device

Item	Cost (Rs.)
Atmega 328P	300.00
GSM Module	2200.00
GPS module	2100.00
APR 9600	700.00
HCSR04 ultrasonic sensor × 3	1050.00
Capacitors, Resistors and Wires	100.00
Copper board ,and other expenses	200.00
Total	6650.00

4. CONCLUSION

The implementation of smart belt for blind people using ultrasonic sensors, GPS and GSM is done. It provides opportunity to find the path while indoor and outdoor travelling and acknowledge a specific person via SMS to get assistance if the blind person lost his way or faced accident during outdoor travelling. High accuracy Ultrasonic sensors were used to identify the barriers around the blind person and different voice outputs were provided by the speaker according to the type of the barrier.

A GPS receiver, GSM module and an emergency key were included to the belt with the intension of sending location details to a predetermined mobile user. During the testing process when the emergency key is pressed, SMS about location detail can be send. Then received location information were checked from Google maps and accuracy of GPS module was around 15m to the actual position.

To improve the accuracy and reliability of the system more accurate GPS receiver and Ultrasonic sensors should be used. Also future development of the system can be carried out increasing number of ultrasonic sensors to cover wide range around blind person and using RFID readers and tags to identify the exact locations.

ACKNOWLEDGEMENTS

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